

# Chromatic Dispersion Statistics of Different Data Sets

Earl Parsons, CommScope

# Supporters

- Ryan Yu, Innolight
- John Johnson, Broadcom
- Chris Cole, Coherent
- Eric Maniloff, Ciena
- Nobuhiko Kikuchi, Hitachi

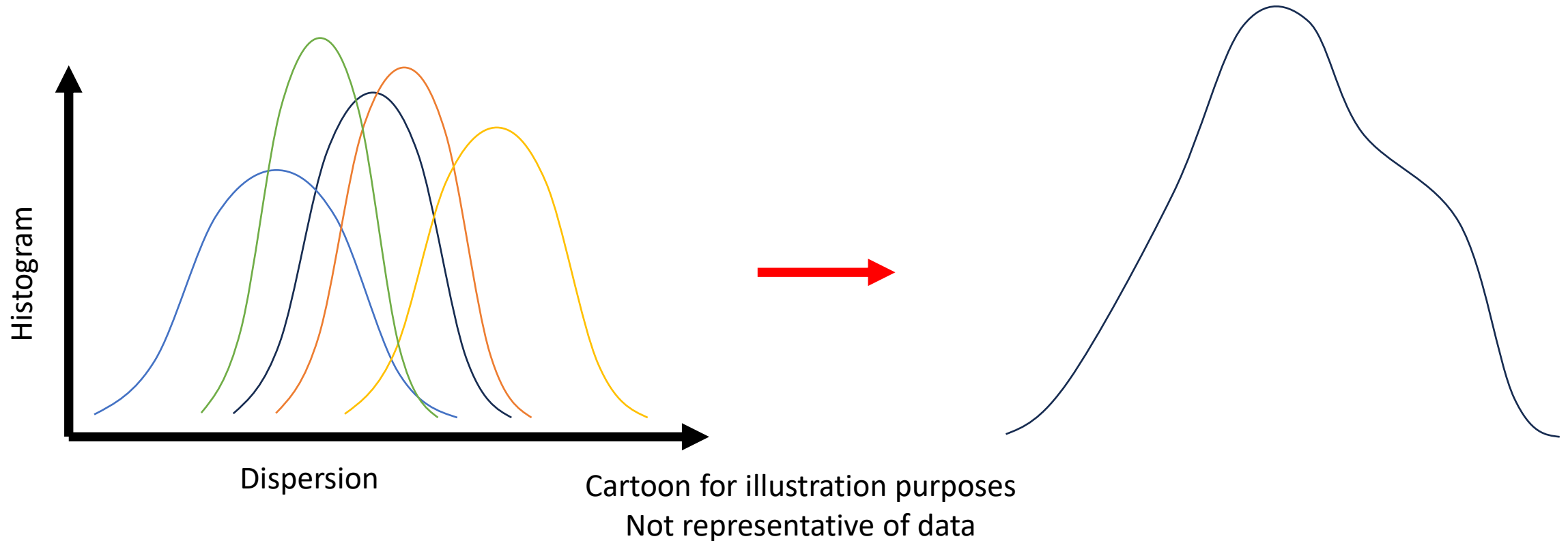
# Updates since May Interim

- In June, ITU-T contribution “Summary for 2nd examination results of the statistical chromatic dispersion property” was circulated with additional chromatic dispersion data
- Included table with dispersion values for different wavelengths, confidence levels, and number of segments
- ITU data and data previously shared into IEEE show good agreement for multi-segment reaches (i.e.  $M=4$ , 99.9%, 10 km)
- Less agreement for single-segment reaches ( $M=1$ ), though CD limits derived from the latest ITU-T dataset and this dataset are closer than before at  $M=1$ ,  $Q=99\%$  for FR4
- Contribution was made into ITU to propose possible reasons for this discrepancy.
  - Was confirmed in meeting that each participant in ITU-T study used raw data and did not treat zero dispersion wavelength and slope as independent variables
- Today I will show dispersion values for  $M=1$  for FR and  $M=4$  for LR for single distributions and mixture distributions

# Review of data set previously presented

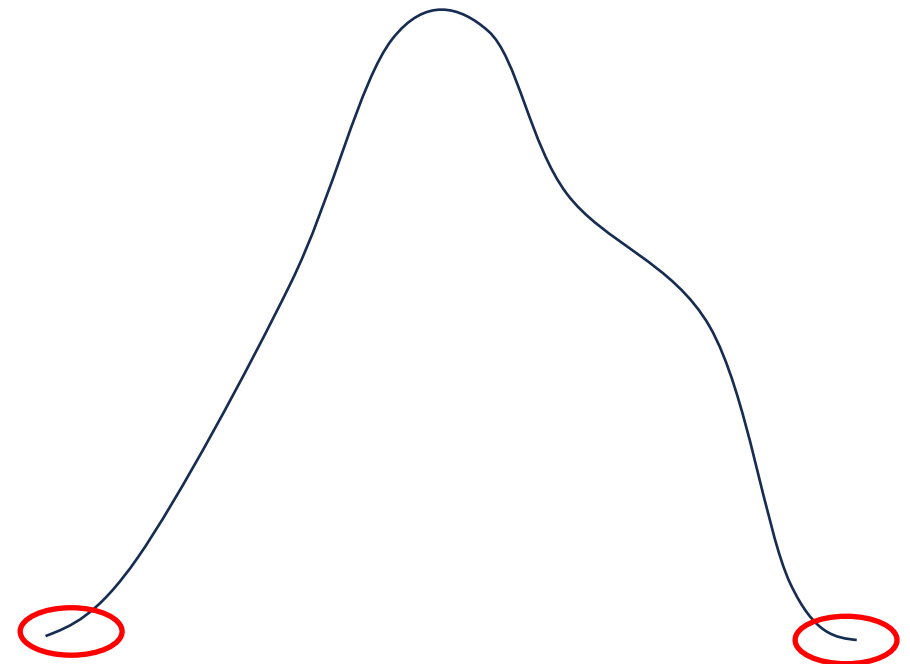
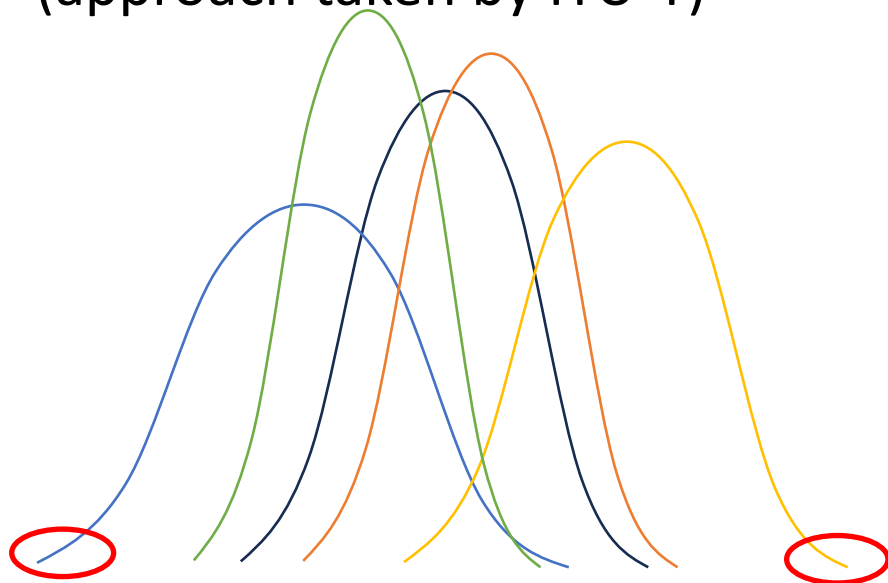
- This data set includes >2.5 million fiber spools
- Fibers compliant to ITU-T standards
  - G.652.D/G.657.A1
  - G.657.A2
- Fibers were shipped from 2013-2024
- Six manufacturers are included with factories in North America, Europe, and Asia (including China)
- This data set covers 64% and ITU-T data set covers 68% of market

# Use distributions from each manufacturer to create a mixture distribution



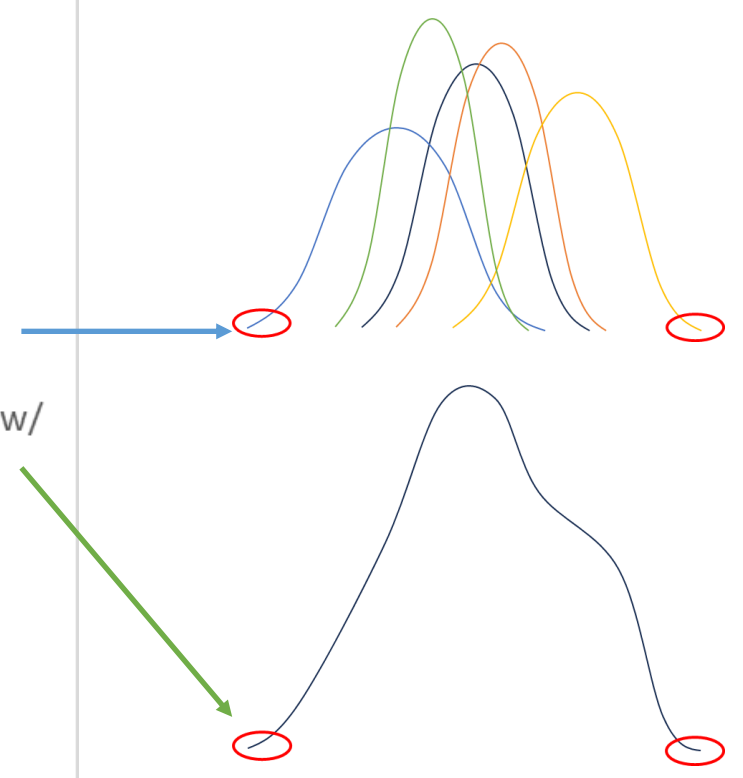
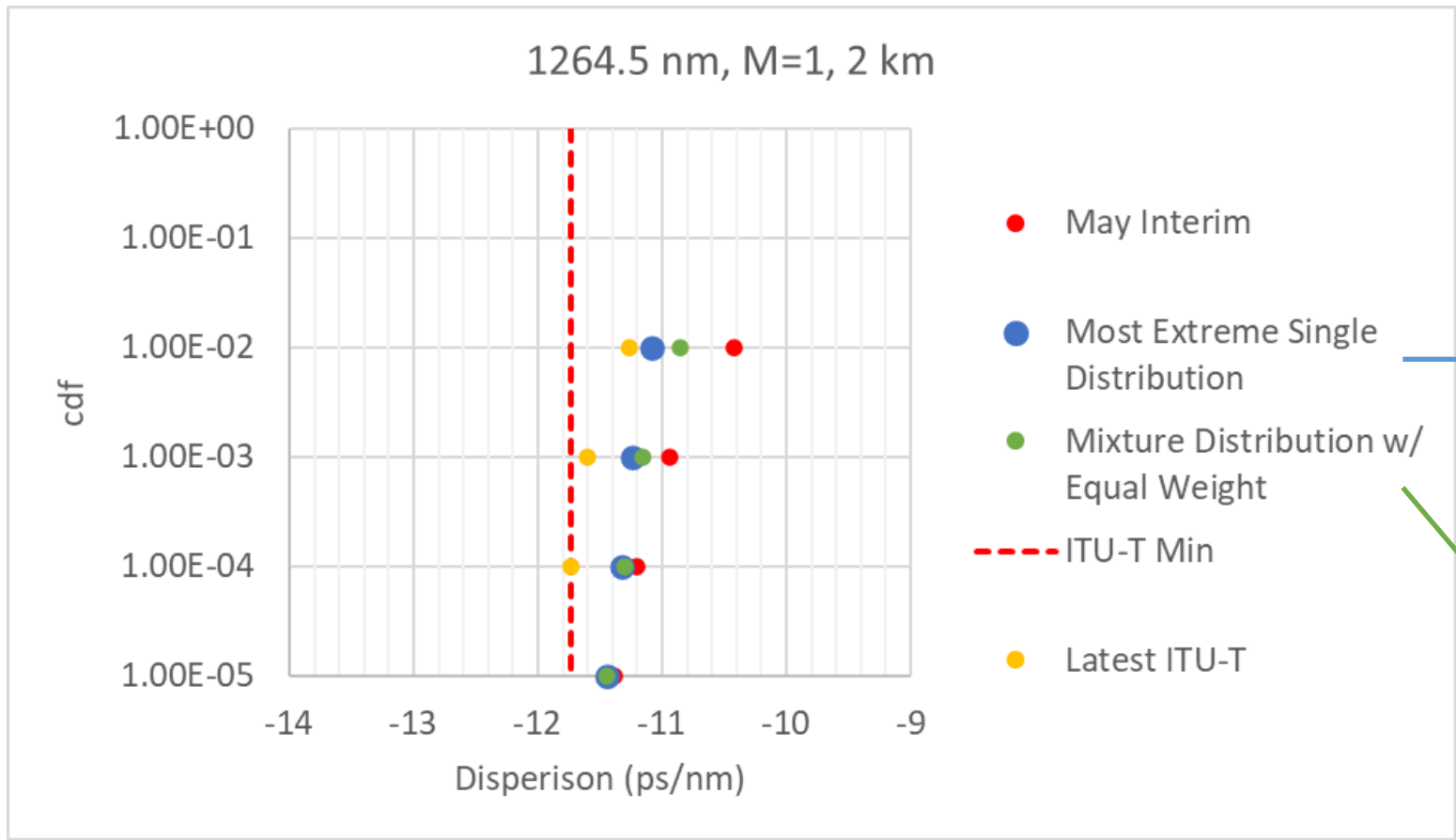
# Look at tails for two scenarios (no curve fitting)

- Most extreme single distribution: Left tail of leftmost distribution and right tail of rightmost distribution (approach taken by ITU-T)
- Mixture distribution with equal weight: Combine all manufacturers with equal weight and look at left and right tail



Cartoon for illustration purposes

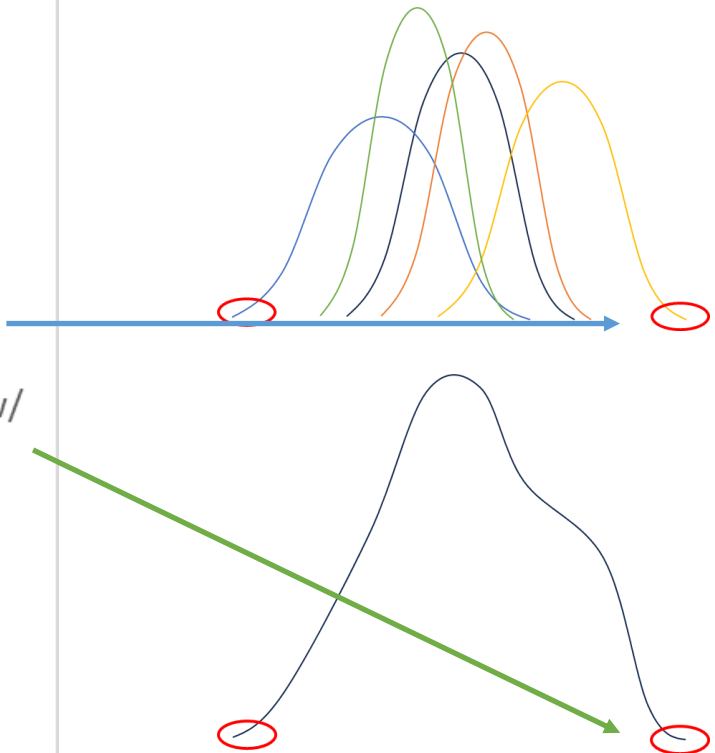
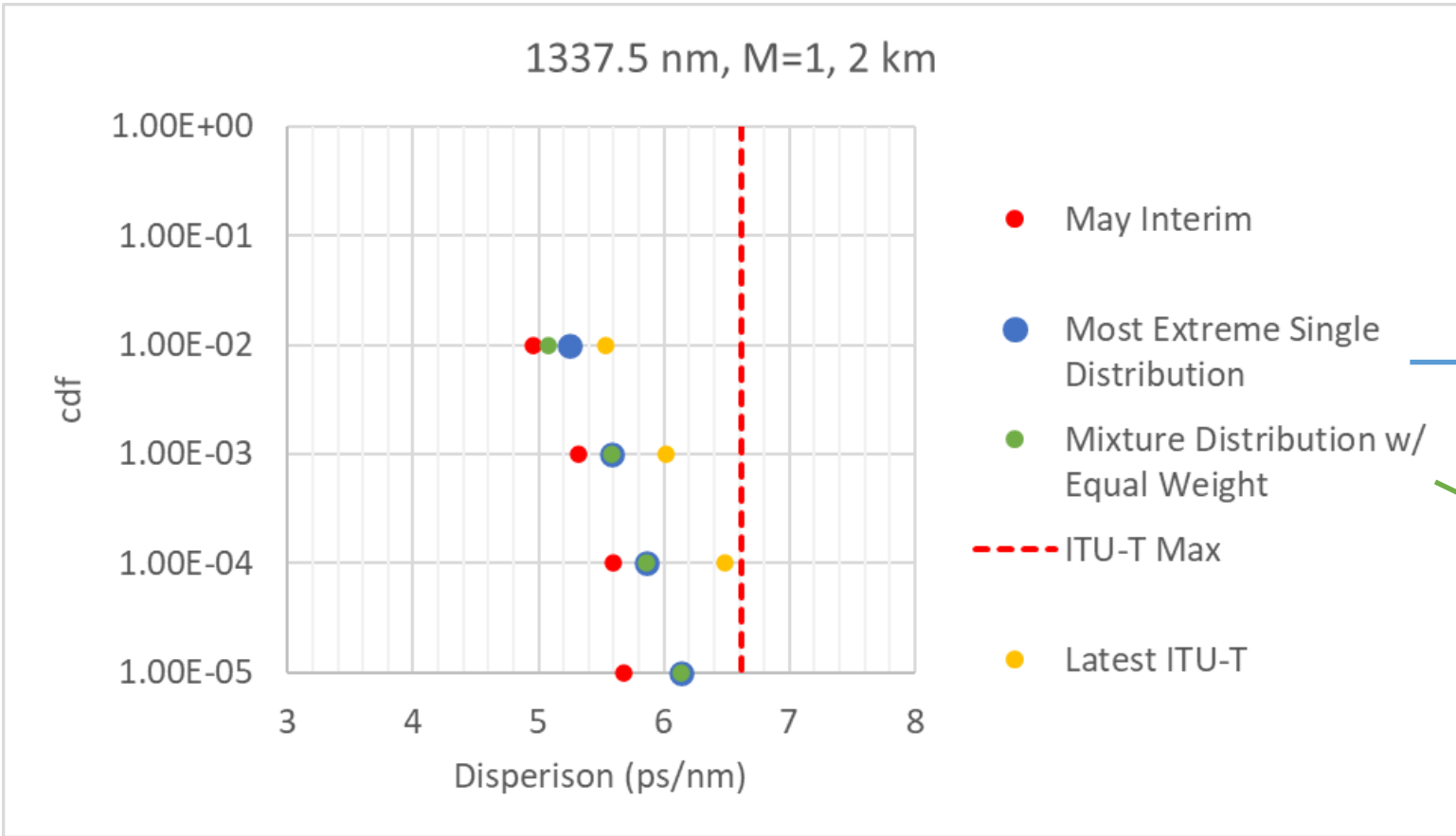
Not representative of data



Cartoon for illustration purposes  
Not representative of data

800G-FR4

Data from left tail of leftmost distribution and from left tail of mixture distribution

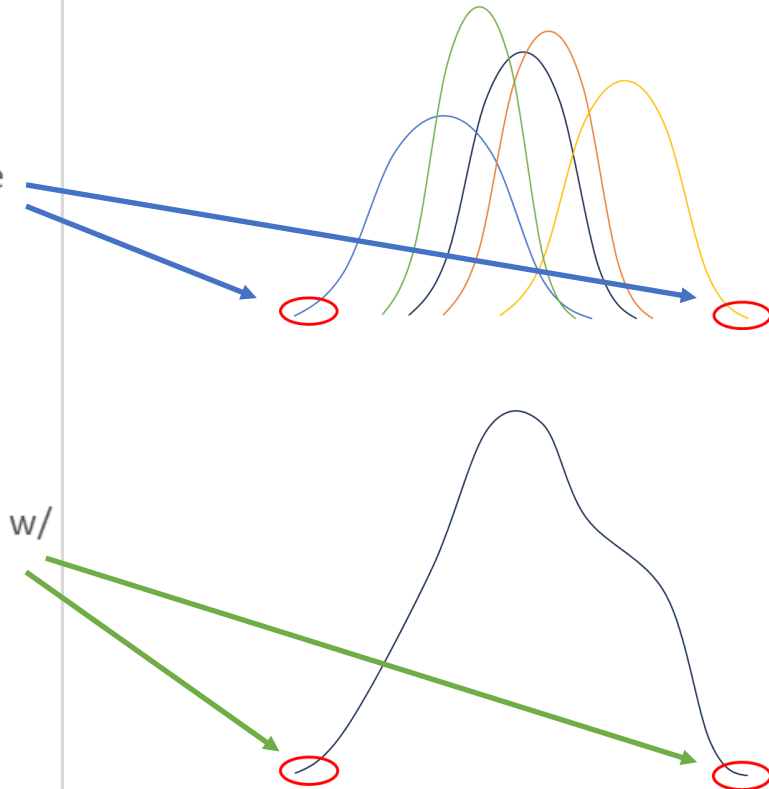
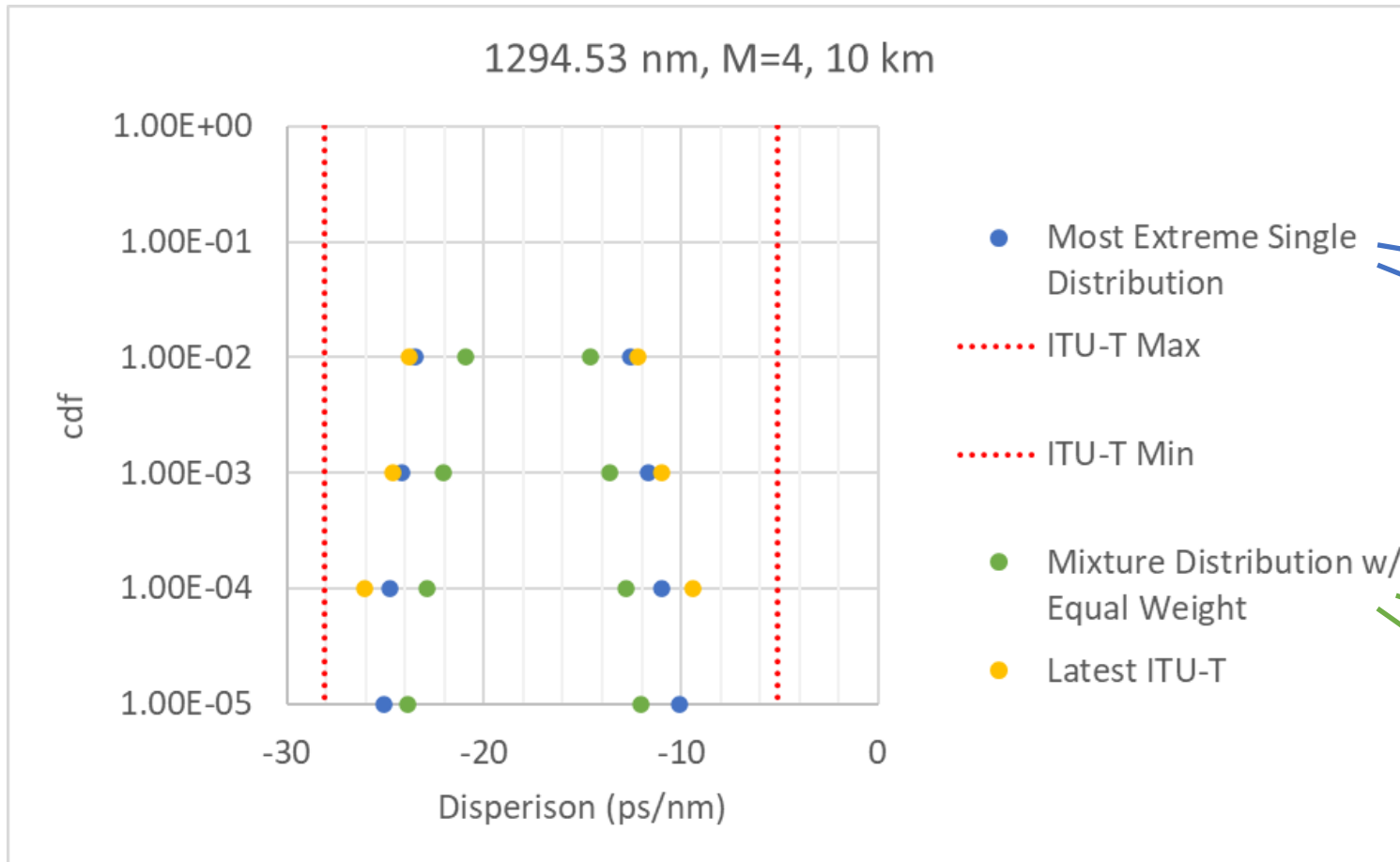


Cartoon for illustration purposes  
Not representative of data

800G-FR4

Data from right tail of rightmost distribution and from right tail of mixture distribution



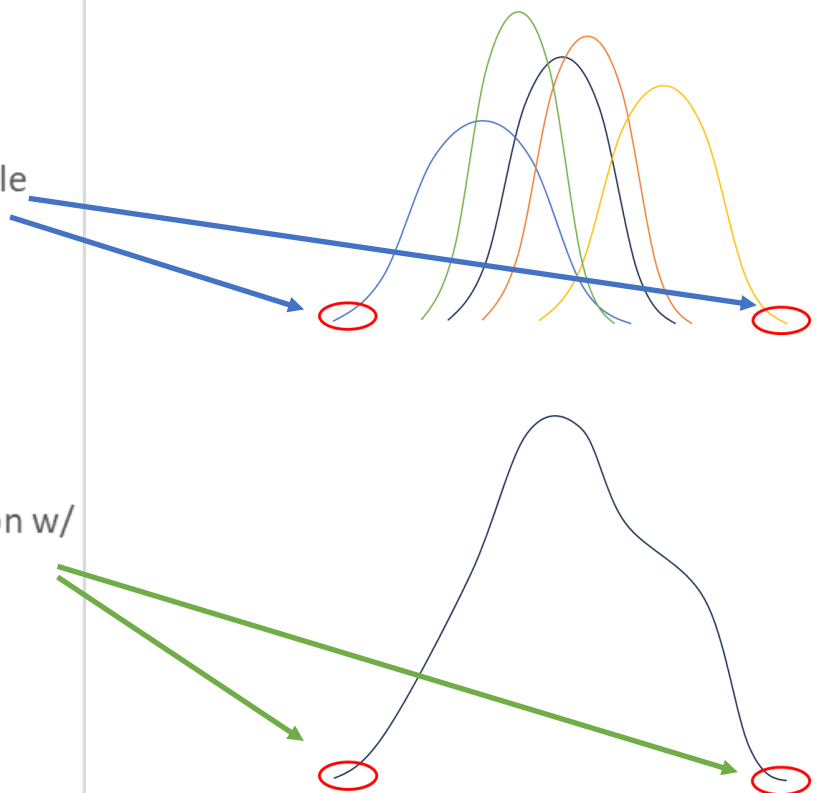
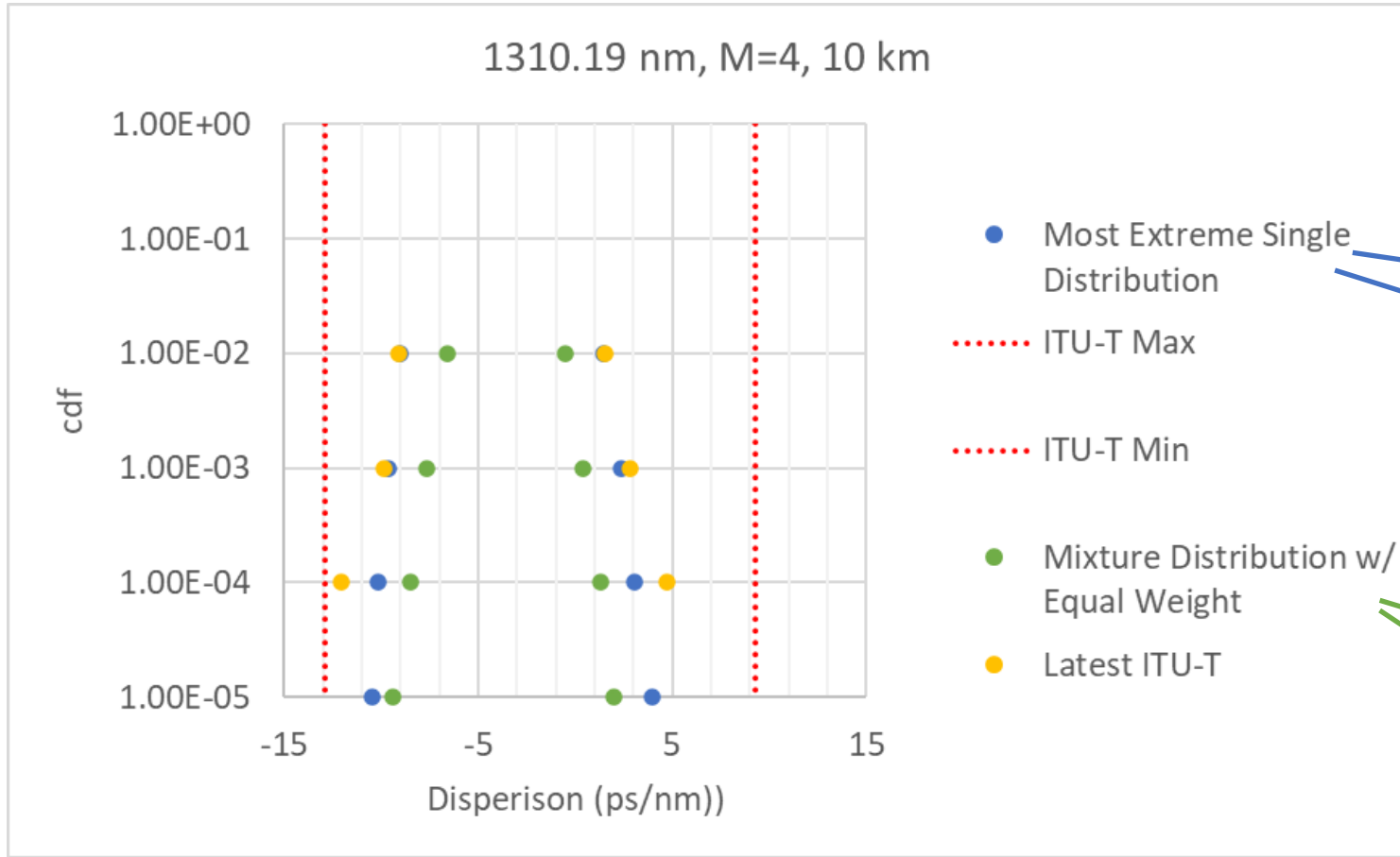


Cartoon for illustration purposes  
Not representative of data

800G-LR4

Data from right tail of rightmost distribution and from left tail of leftmost distribution

Look at right and left tails of mixture distribution



Cartoon for illustration purposes  
Not representative of data

### 800G-LR4

Data from right tail of rightmost distribution and from left tail of leftmost distribution

Look at right and left tails of mixture distribution

# Conclusion

- Dispersion results for FR wavelengths with  $M=1$  and (2 km) and for LR wavelengths with  $M=4$  and (10km) presented with different probability ( $Q$ ) values.
- ITU data and data previous shared into IEEE show good agreement for multi-segment reaches (i.e.  $M=4$ , 99.9%, 10 km)
- Less agreement for single-segment reaches ( $M=1$ ), though CD limits derived from the latest ITU-T dataset and this dataset are closer than before at  $M=1$ ,  $Q=99\%$  for FR4